Thermal Conductivity and Viscosity of Ethylene Glycol and Silicone Oil-based Nanofluids

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As emerging topic nanofluids has received immense attention from the researcher worldwide due to their potential applications in numerous important fields such as microelectronics, MEMS, microfluidics, transportation, manufacturing, medical and HVAC systems [1-3]. Nanofluids are defined as the dispersions of nanoparticles in traditional heat transfer fluids. Studies showed that these nanofluids exhibit superior thermophysical properties compared to their base fluids. Compared to studies on thermal conductivity of water-based nanofluids [1-3], very little efforts [4-5] have been made on viscosity of nanofluids with various base fluids. However, viscosity is as crucial as thermal conductivity in engineering systems that employ fluid flows. In this study, several types of nanofluids are prepared by dispersing TiO_2 nanoparticles of 20 nm and 80 nm in ethylene glycol and silicone oil. The effects of temperature, particle concentration, particle size and base fluids on thermal conductivity and viscosity of these nanofluids are investigated. A KD2 Pro Thermal Properties Analyzer is used to measure the thermal conductivity of sample fluids. Results demonstrated that the thermal conductivity of TiO_2 (20nm)/ethylene glycol-based nanofluids changed negligibly with increasing temperature from 20°C to 40°C. However, thermal conductivity of this nanofluid increased considerably with volumetric concentration of nanoparticles at room temperature. For example, at 0.1% volumetric loading of TiO_2, the thermal conductivity of ethylene glycol increased about 5%. More interesting results will be reported and analyzed.

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